

U.S. Serial No. 10/811,868

TSM-38

IN THE CLAIMS

1. (Currently amended) A management computer connected through a second network to data storage apparatuses that are connected to computers through a first network, said management computer comprising:

a storage area information collecting module which collects respective pieces of storage area information from said data storage apparatuses connected through the second network, wherein each piece of storage area information relates to storage areas provided by a data storage apparatus concerned;

a hierarchy information collecting module which collects respective pieces of hierarchy information from said data storage apparatuses connected through said second network, wherein each piece of hierarchy information indicates a data storage apparatus hierarchy of a multistage connection of said data storage apparatuses, including those data storage apparatuses that have storage areas for storing data used by said computers through a storage area of a higher one of said data storage apparatuses according to said hierarchy among data storage apparatuses held by a data storage apparatus concerned; and

U.S. Serial No. 10/811,868

TSM-38

a management relation information creation module which sets said hierarchy hierarchies among said data storage apparatuses to create management relation information, based on said pieces of storage area information and said pieces of hierarchy information collected in said storage area information collecting module and said hierarchy information collecting module.

2. (Original) A management computer according to claim 1, wherein:

said management computer further comprises:

a management information creation module that recognizes a number of data storage apparatuses according to a number of said pieces of storage area information collected in said storage area information collecting module and prepares pieces of management information used respectively for managing said data storage apparatuses, wherein a number of said pieces is equal to a recognized number of data storage apparatuses; and

said management relation information creation module associates each of said data storage apparatuses with a piece of management information used for managing the data storage apparatus in question, and adds information

U.S. Serial No. 10/811,868

TSM-38

indicating the association to said management relation information.

3. (Original) A management computer according to Claim 1, further comprising:

a screen data creation module which creates hierarchy display screen data that is used for displaying said data storage apparatuses on a screen according to the hierarchy set in said management relation information creation module; and

a screen data sending module which sends said hierarchy display screen data created in said screen data creation module to an output device connected to the management computer itself.

4. (Original) A management computer according to Claim 3, wherein:

said screen data creation module creates pieces of data storage apparatus display data for respectively specifying said data storage apparatuses in said hierarchy display screen data, and adds pieces of information identifying those pieces of data storage apparatus display data to said

U.S. Serial No. 10/811,868

TSM-38

management relation information to hold those pieces of information in said management relation information.

5. (Currently amended) A management computer according to Claim 4, further comprising:

a management module choosing module that refers to said management relation information to extract a piece of management information corresponding to a certain piece of data storage apparatus display data that is chosen when an instruction to ~~choose~~ choose said certain piece of data storage apparatus display data is received from said output device, and sends the extracted piece of management information to said output device.

6. (Currently amended) A management computer according to Claim 4, further comprising:

a warning message creation module that:
refers to said management relation information when an instruction to ~~choose~~ choose a certain piece of data storage apparatus display data is received from said output device, to extract a data storage apparatus held in said management relation information being associated with the chosen piece of data storage apparatus display data;

U.S. Serial No. 10/811,868

TSM-38

judges whether the extracted data storage apparatus is a first type of data storage apparatus ~~(a first type data storage apparatus)~~ providing a storage area for storing data used by a computer or a second type of data storage apparatus ~~(a second type data storage apparatus)~~ providing a storage area for storing data used by a computer through said first type of data storage apparatus; and

when the extracted data storage apparatus is judged to be said second type of data storage apparatus, creates a warning message to send the created warning message to said output device.

7. (Currently amended) A management computer according to Claim 3, further comprising:

a notification modification module that:

refers to said management relation information to judge whether a data storage apparatus as a source of a status change notification is a first type of data storage apparatus ~~(a first type data storage apparatus)~~ providing a storage area for storing data used by a computer or a second type of data storage apparatus ~~(a second type data storage apparatus)~~ providing a storage area for storing data used by a computer through said first type data storage apparatus,

U.S. Serial No. 10/811,868

TSM-38

when said status change notification is received from said data storage apparatus connected to said management computer through said second network; and

when said data storage apparatus is judged to be said second type of data storage apparatus, refers to said management relation information to create a new display message by reflecting the hierarchy acquired from said management relation information onto contents of the received notification.

8-11. (Canceled).

12. (Currently amended) A computer system comprising:
a group of data storage apparatuses including at least one first type of data storage apparatus providing a storage area for storing data used by a computer and at least one second type of data storage apparatus providing a storage area for storing data used by said computer through [[a]] the first type of data storage apparatus;

a management computer that manages said group of data storage apparatuses;

a first network connecting between said computer and said group of data storage apparatuses;

U.S. Serial No. 10/811,868

TSM-38

a second network connecting between said group of data storage apparatuses and said management computer; wherein:

said management computer comprises:

a storage area information collecting module which collects respective pieces of storage area information from said data storage apparatuses connected through said second network, wherein each piece of storage area information relates to storage areas provided by a data storage apparatus concerned;

a hierarchy information collecting module which collects respective pieces of hierarchy information from said data storage apparatuses connected through said second network, wherein each piece of hierarchy information indicates a data storage apparatus hierarchy of a multistage connection of said data storage apparatuses, including those data storage apparatuses that have storage areas for storing data used by said computers through a storage area of a higher one of said data storage apparatuses according to said hierarchy ~~among data storage apparatuses held by a data storage apparatus concerned; and~~

a management relation information creation module which sets said hierarchy hierarchies among said data storage

U.S. Serial No. 10/811,868

TSM-38

apparatuses to create management relation information based on said pieces of storage area information and said pieces of hierarchy information collected in said storage area information collecting module and said hierarchy information collecting module.

13. (Currently amended) A ~~data storage apparatus~~ management method in a management computer connected through a second network to data storage apparatuses that are connected to computers through a first network, the method comprising steps of:

collecting respective pieces of storage area information from said data storage apparatuses connected through said second network, wherein each piece of storage area information relates to storage areas provided by a data storage apparatus concerned;

collecting respective pieces of hierarchy information from said data storage apparatuses connected through said second network, wherein each piece of hierarchy information indicates a data storage apparatus hierarchy of a multistage connection of said data storage apparatuses, including those data storage apparatuses that have storage areas for storing data used by said computers through a storage area of a

U.S. Serial No. 10/811,868

TSM-38

higher one of said data storage apparatuses according to
said hierarchy ~~among data storage apparatuses held by a data~~
~~storage apparatus concerned; and~~

setting said hierarchy hierarchies among said data
storage apparatuses to create management relation
information, based on said pieces of storage area
information and said pieces of hierarchy information.

14. (Currently amended) A ~~data storage apparatus~~
management method according to Claim 13, further comprising
steps of:

recognizing a number of data storage apparatuses
according to a number of said pieces of the collected
storage area information;
preparing pieces of management information for respectively
managing data storage apparatuses, wherein a number of said
pieces is equal to a recognized number of data storage
apparatuses; and

associating each of said data storage apparatuses with a
piece of management information used for managing the data
storage apparatus in question and adding information
indicating the association to said management relation

U.S. Serial No. 10/811,868

TSM-38

information, in creating said management relation information.

15. (Currently amended) A ~~data storage apparatus~~ management method according to Claim 13, further comprising steps of:

creating hierarchy display screen data that is used for displaying said data storage apparatuses on a screen according to said management relation information; and

sending said created hierarchy display screen data to an output device connected to the management computer itself.

16. (Currently amended) A ~~data storage apparatus~~ management method according to Claim 15, further comprising of steps of:

creating pieces of data storage apparatus display data for respectively specifying said data storage apparatuses in said hierarchy display screen data, when said hierarchy display screen data is created; and

adding pieces of information identifying those pieces of data storage apparatus display data to said management relation information, to hold those pieces of information in said management relation information.

U.S. Serial No. 10/811,868

TSM-38

17. (Currently amended) A ~~data storage apparatus~~ management method according to Claim 16, further comprising a step of:

referring to said management relation information to extract a piece of management information corresponding to a certain piece of data storage apparatus display data that is chosen when an instruction to choice said certain piece of data storage apparatus display data is received from said output device, and sending the extracted piece of management information to said output device.

18. (Currently amended) A ~~data storage apparatus~~ management method according to Claim 17, further comprising steps of:

referring to said management relation information when an instruction to choice a certain piece of data storage apparatus display data is received from said output device, to extract a data storage apparatus held in said management relation information being associated with the chosen piece of data storage apparatus display data;

U.S. Serial No. 10/811,868

TSM-38

judging whether the extracted data storage apparatus is a data storage apparatus (a first type data storage apparatus) providing a storage area for storing data used by said computer or a data storage apparatus (a second type data storage apparatus) providing a storage area for storing data used by said computer through said first type data storage apparatus; and

creating a warning message to send the created warning message to said output device, when the extracted data storage apparatus is judged to be said second type of data storage apparatus.

19. (Canceled).

20. (Currently amended) A computer system comprising:

a computer;

data storage apparatuses;

a management computer that manages said data storage apparatuses;

a first network connecting between computers and said data storage apparatuses;

U.S. Serial No. 10/811,868

TSM-38

a second network connecting between said data storage apparatuses and said management computer; and

a management console connected to said management computer; wherein:

said data storage apparatuses ~~includes~~ include one or more first type of data storage apparatuses apparatus each providing storage areas for storing data used by said computers, [[;]] and one or more second type of data storage apparatuses apparatus each providing storage areas for storing data used by said computers through a storage area of said first type data storage apparatuses;

said management computer comprises [[:]] a storage area information collecting module, a management information creation module, a hierarchy information collecting module, a management relation information creation module, a screen data creation module, a screen data sending module, a warning message creation module, a management module choosing module, a notification modification module, a modification notification sending module;

wherein said [[a]] storage area information collecting module ~~which collects~~ issues a request to said data storage apparatuses for respective pieces of storage area

U.S. Serial No. 10/811,868

TSM-38

information from said data storage apparatuses, wherein the data storage apparatuses receive the request from the storage area information collecting module, and send the respective pieces of storage area information to the storage area information collecting module in response to the request, and wherein each piece of storage area information relates to storage areas provided by a data storage apparatus concerned;

wherein said [[a]] management information creation module ~~that~~ recognizes a number of data storage apparatuses according to a number of said pieces of storage area information collected in said storage area information collecting module and prepares pieces of management information used respectively for managing said data storage apparatuses, wherein a number of said pieces is equal to a recognized number of data storage apparatuses;

wherein said [[a]] hierarchy information collecting module ~~which collects~~ issues a request to the data storage apparatuses for respective pieces of hierarchy information, wherein the data storage apparatuses receive the request, and in response to the request, send the respective pieces of hierarchy information ~~from said data storage apparatuses~~

U.S. Serial No. 10/811,868

TSM-38

to the hierarchy information collecting module, wherein each piece of hierarchy information indicates a data storage apparatus hierarchy of a multistage connection of said data storage apparatuses, including those data storage apparatuses that have storage areas for storing data used by said computers through a storage area of a higher one of said data storage apparatuses according to said hierarchy among data storage apparatuses held by a data storage apparatus concerned;

wherein among data storage apparatuses which are in said multistage connection, a higher one of said data storage apparatuses according to said hierarchy is designated as the first type of data storage apparatus and another one of said data storage apparatuses that is lower in said hierarchy than said higher one is designated as the second type of data storage apparatus, data to be stored in a second storage area of a data storage apparatus of the second type is a copy of data stored in a first storage area of a data storage apparatus of the first type, and the first storage area is a virtual storage area viewed by the host computer as being formed in a data storage apparatus of the first type, and the data used by the host computer viewed as being

TSM-38

U.S. Serial No. 10/811,868

virtually stored in the first storage area is physically stored in a second storage area of the second type;

wherein said [(a)] management relation information creation module ~~which~~ sets said hierarchy hierarchies among said data storage apparatuses to create management relation information, based on said pieces of storage area information, said pieces of management information and said pieces of hierarchy information collected in said storage area information collecting module, said management information creation module and said hierarchy information collecting module;

wherein said [(a)] screen data creation module ~~that~~ creates hierarchy display screen data that is used for displaying said data storage apparatuses according to the hierarchy set in said management relation information creation module and pieces of data storage apparatus display data for respectively specifying said data storage apparatuses in said hierarchy display screen data, and adds pieces of information identifying those pieces of data storage apparatus display data to said management relation information;

U.S. Serial No. 10/811,868

TSM-38

wherein said ~~[[a]]~~ screen data sending module ~~which~~ sends said hierarchy display screen data created in said screen data creation module and said data storage apparatus display data to said management console;

wherein said ~~[[a]]~~ warning message creation module ~~that~~: refers to said management relation information when an instruction to choice a certain piece of data storage apparatus display data is received from said management console, to extract a data storage apparatus held in said management relation information being associated with the chosen piece of data storage apparatus display data;

judges whether the extracted data storage apparatus is ~~[[a]]~~ said first type of data storage apparatus or ~~[[a]]~~ said second type of data storage apparatus; and

when the extracted data storage apparatus is judged to be said second type of data storage apparatus, creates a warning message to send the created warning message to said management console;

wherein said ~~[[a]]~~ management module choosing module ~~that~~ refers to said management relation information to extract a piece of management information corresponding to a certain piece of data storage apparatus display data that is

U.S. Serial No. 10/811,868

TSM-38

chosen when an instruction to ~~choiee~~ choose said certain piece of data storage apparatus display data is received from said management console, and sends the extracted piece of management information to said management console;

wherein said [[a]] notification modification module ~~that:~~

refers to said management relation information to judge whether a data storage apparatus as a source of a status change notification is [[a]] said first type of data storage apparatus or [[a]] said second type of data storage apparatus, when said status change notification is received from said data storage apparatus (~~i.e., said source of the status change notification~~); and

when said data storage apparatus is ~~judge~~ judged to be said second type of data storage apparatus, refers to said management relation information to create a new display message by reflecting the hierarchy acquired from said management relation information onto contents of the received notification; and

wherein said [[a]] modification notification sending module ~~which~~ sends the display message created in said notification modification module to said management console;

U.S. Serial No. 10/811,868

TSM-38

wherein said management console comprises:

a display module which displays the display data received from said management computer;

an instruction receiving module which receives an instruction from an administrator through said display module; and

an instruction sending module which sends an instruction received from the administrator through said instruction receiving module to said management computer;

said display module comprises a hierarchy display area, a warning message display area and a status change notification information display area;

said hierarchy display area displays said hierarchy display screen data and said data storage apparatus display data;

said warning message display area displays said warning message; and

said status change notification information display area displays the display message received from said modification notification sending module.

U.S. Serial No. 10/811,868

TSM-38

21. (New) A management computer according to claim 1, wherein among data storage apparatuses which are in said multistage connection, a higher one of said data storage apparatuses according to said hierarchy is designated as a first type of data storage apparatus and another one of said data storage apparatuses that is lower in said hierarchy than said higher one is designated as a second type of data storage apparatus, and

data to be stored in a second storage area of a data storage apparatus of the second type is a copy of data stored in a first storage area of a data storage apparatus of the first type.

22. (New) A management computer according to claim 21, wherein among data storage apparatuses which are in said multistage connection, a higher one of said data storage apparatuses according to said hierarchy is designated as a first type of data storage apparatus and another one of said data storage apparatuses that is lower in said hierarchy than said higher one is designated as a second type of data storage apparatus, and

U.S. Serial No. 10/811,868

TSM-38

a first storage area is a virtual storage area viewed by the host computer as being formed in a data storage apparatus of the first type, and the data used by the host computer viewed as being virtually stored in the first storage area is physically stored in a second storage area of the second type.

23. (New) A computer system according to claim 12, wherein among data storage apparatuses which are in said multistage connection, a higher one of said data storage apparatuses according to said hierarchy is designated as the first type of data storage apparatus and another one of said data storage apparatuses that is lower in said hierarchy than said higher one is designated as the second type of data storage apparatus, and

data to be stored in a second storage area of a data storage apparatus of the second type is a copy of data stored in a first storage area of a data storage apparatus of the first type.

24. (New) A computer system according to claim 23, wherein among data storage apparatuses which are in said

U.S. Serial No. 10/811,868

TSM-38

multistage connection, a higher one of said data storage apparatuses according to said hierarchy is designated as the first type of data storage apparatus and another one of said data storage apparatuses that is lower in said hierarchy than said higher one is designated as the second type of data storage apparatus, and

a first storage area is a virtual storage area viewed by the host computer as being formed in a data storage apparatus of the first type, and the data used by the host computer viewed as being virtually stored in the first storage area is physically stored in a second storage area of the second type.